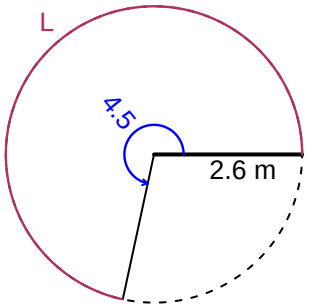
Name: Date:

Trig Final (SLTN v665)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 2.6 meters. The angle measure is 4.5 radians. How long is the arc in meters?

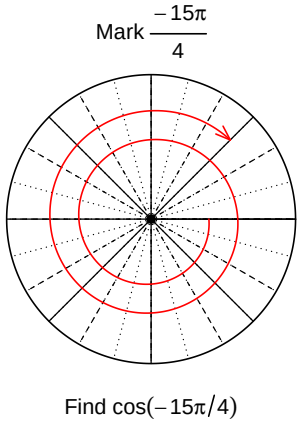


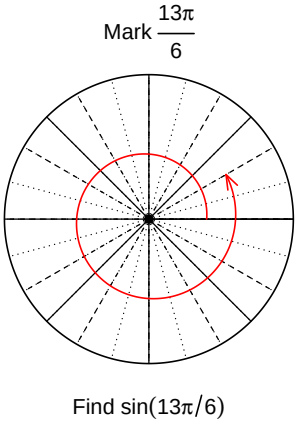
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$L = 11.7$ meters.

Question 2

Consider angles $\frac{-15\pi}{4}$ and $\frac{13\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-15\pi}{4}\right)$ and $\sin\left(\frac{13\pi}{6}\right)$ by using a unit circle (provided separately).





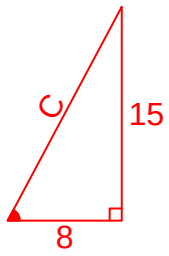
$\cos(-15\pi/4) = \frac{\sqrt{2}}{2}$

$\sin(13\pi/6) = \frac{1}{2}$

Question 3

If $\tan(\theta) = \frac{15}{8}$, and θ is in quadrant III, determine an exact value for $\sin(\theta)$.

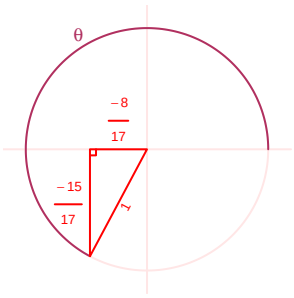
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$8^2 + 15^2 = C^2$$
$$C = \sqrt{8^2 + 15^2}$$
$$C = 17$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\sin(\theta) = \frac{-15}{17}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = 3.65$ meters, a frequency of 8.14 Hz, and an amplitude of 6.41 meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -6.41\sin(2\pi 8.14t) + 3.65$$

or

$$y = -6.41\sin(16.28\pi t) + 3.65$$

or

$$y = -6.41\sin(51.15t) + 3.65$$